

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04L 12/28		A1	(11) International Publication Number: WO 00/64103
			(43) International Publication Date: 26 October 2000 (26.10.00)
(21) International Application Number: PCT/SE00/00746		(81) Designated States: EE, LT, LV, NO, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 19 April 2000 (19.04.00)			
(30) Priority Data: 9901382-3 19 April 1999 (19.04.99) SE		Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(71) Applicant: TELIA AB [SE/SE]; Mårbackagatan 11, S-123 86 Farsta (SE).			
(72) Inventors: HALLKVIST, Per; Annebodavägen 66, S-125 71 Älvsjö (SE). RÖSTÖ, Tommy; Snörmakarvägen 49B, S-168 38 Bromma (SE). RÖDESTRAND, Thomas; Dammkärrsvägen 15, S-618 95 Stavsjö (SE).			
(74) Agent: PRAGSTEN, Rolf; Telia Research AB, Vitsandsgatan 9, S-123 86 Farsta (SE).			
(54) Title: A PROCEDURE FOR CONTROLLING A DATA CONNECTION IN A DIGITAL CELLULAR NETWORK, WHERE A CONNECTION IS SET UP AND ITS CHARACTERISTICS CHANGED DEPENDING ON THE DETECTED NEED			
(57) Abstract			
<p>A procedure and a device for control of data connections is shown. The procedure and the device are utilised in a digital, cellular communication network in which need of data transmission between a user terminal and a long-distance network is detected. A data connection between the user terminal and the long-distance network is set up and its characteristics are changed depending on the detected need.</p>			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

A PROCEDURE FOR CONTROLLING A DATA CONNECTION IN A DIGITAL CELLULAR NETWORK, WHERE A CONNECTION IS SET UP AND ITS CHARACTERISTICS CHANGED DEPENDING ON THE DETECTED NEED

TECHNICAL FIELD

The present invention relates to a procedure and a device for control of data connections in a digital, cellular communication network between a user terminal and a long-distance network.

PRIOR ART

Today there are several technologies for data transmission via a digital, cellular communication network, such as a GSM-network, defined. Examples of such technologies are High Speed Circuit Switched Data (HSCSD) and General Packet Radio Service (GPRS). The different technologies realise data transmissions in different ways. HSCSD is a circuit switched technology where the data transmission is made via a data connection with one or more guaranteed allocated time slots. GPRS is a packet switched technology where the data transmission is made by packets with one or more dynamically allocated time slots. The number of mobile terminals from different terminal manufacturers that support data is also increasing.

To make data transmissions possible in the digital, cellular communication network, is required that these can be managed in the network. It can for instance be necessary to allocate resources in the network, supervise utilised resources etc. For a HSCSD-service in a TDMA-network, such as a GSM-network, is for instance resource allocation made in form of allocation of a number of time slots to a data connection over which the data transmission shall be made.

It is also required that the terminals, between which the data transmission shall be made, can manage data transmissions via the technology that is utilised, such as

HSCSD or GPRS, via an interface towards the digital, cellular communication network.

Finally is also required that there is an interface between the user and the user terminal.

Different terminal manufacturers have arranged for terminal specific software for managing of data transmission in a digital, cellular communication network. Because the data transmission is made via a network operator's digital, cellular communication network, these communication networks must be able to manage data transmission between several different types of terminals, which results in adaptation problems when new terminal specific solutions are introduced. Moreover, a user can be obliged to use different interfaces for one and the same service for terminals from different manufacturers.

A general and overall problem with the technologies for transmission of data further is that users experience them as expensive and difficult to use.

DESCRIPTION OF THE INVENTION

The aim of the present invention is to remove above mentioned problem that communication networks have to manage transmission of data between several different types of terminals, and that a user can be forced to use different interfaces for one and the same service for terminals from different manufacturers, and to reduce the problem that users experience the technologies for transmission of data as expensive and difficult to use.

These aims are, according to the invention, achieved by a procedure for control of data connections in a digital,

cellular, communication network in which need of data transmission between the user terminal and the long-distance network is detected. A data connection between the user terminal and the long-distance network is established 5 and its characteristics are changed depending on the detected need.

Advantages of this procedure are that a data connection between the user terminal and the long-distance network is 10 only set up when an access to the long-distance network is needed. The user consequently does not need to be connected before the need exists, which results in lower utilisation of resources and consequently also lower cost. The set up of the connection is made without the user needing to enter 15 any commands at the terminal, which reduces the management for the user.

In one embodiment of the procedure according to the invention, the data transmission need is detected as a need 20 of transmission speed between the user terminal and the long-distance network. The characteristics of the data connection is then changed by increasing the transmission speed of the data connection when the need of transmission speed between the user terminal and the long-distance 25 network is greater than the current transmission speed of the data connection, and that the transmission speed of the data connection is reduced when the need of transmission speed between the user terminal and the long-distance network is smaller than the current transmission speed of 30 the data connection. An advantage with this procedure, where the transmission speed of the data connection that is established between the user terminal and the long-distance network is adapted dynamically according to the transmission speed that is needed at the moment, is that 35 the transmission speed of the data connection never exceeds the need of transmission speed.

Consumption of resources consequently can be reduced, and by that also costs, in comparison with a data connection with fixed transmission speed. Another advantage is that the user need not change the transmission speed manually, 5 which results in easier handling for the user.

In another embodiment of the procedure according to the invention the data connection is disconnected when a lack of a need of data transmission between the user terminal 10 and the long-distance network is detected during one in advance determined period of time. An advantage of this is that the procedure results in that the data connection is only set up if there is a need of data transmission. The utilisation of resources consequently is further reduced 15 and by that also the costs. Yet another advantage with this embodiment is that the user need not look after when there is a need of data transmission, which results in an easier management for the user.

20 In one more embodiment of a procedure according to the invention is detected if a break occurs. If a break is detected, a data connection is set up between the user terminal and the long-distance network depending on the need of data transmission between the user terminal and the 25 long-distance network. An advantage of this is that the user need not initiate the set up of a connection manually if a break occurs. This results in easier management for the user.

30 In one more embodiment of a procedure according to the invention, where the data connection in the first digital, cellular communication network is set up between the user terminal and the long-distance network via a second digital, cellular communication network, is collected, 35 depending on a request controlled by the user, information about accessible digital, cellular

communication networks, such as accessible digital, cellular communication networks and debiting conditions for utilisation of resources in the different communication networks. Depending on the information about accessible digital, cellular communication networks, together with in advance determined criteria, one network out of the accessible, digital, cellular communication networks is utilised. For instance can that network be utilised that gives the lowest cost. An advantage of this procedure is that it gives possibility for the user always to use the network that gives the lowest cost when the user is outside the area where the first network, in which he/she is subscriber, is accessible and the user consequently has to utilise a second network to access the first network, so called roaming.

In one more embodiment of the procedure according to the invention, an application that has an intermittent need of data transmission between the user terminal and the long-distance network is detected. The data transmissions of this application between the user terminal and the long-distance network is then filtered. An advantage of this is that applications that make regular attempts to access a long-distance network, which attempts are not necessary for the user, can be controlled so that unnecessary set ups of connections are avoided. This will reduce the costs for the user.

In one more embodiment of the procedure according to the invention is collected, depending on input by a user, information related to the data connection, such as debiting terms/conditions, error management tables and costs for data connections since the latest billing. A number of parameters for the data connection, such as transmission speed of the data connection at each point of time and the time the data connection has the same

transmission speed, are measured. Depending on the data connection related information, the characteristic data for the data connections are calculated, such as transmission speed, cost so far for the current data connection, and cost so far during one in advance determined period of time, and its characteristic data are shown to the user on a status screen to be used as basic data for decision-making by the user. An advantage of this embodiment is that the user will have a better base for making decisions, such as to decide whether the data connection shall be disconnected when the cost exceeds a certain level.

The aims are achieved according to the invention also by means of a device for control of data connections in a first, digital, cellular communication network, which includes a device for detection of need of data transmission between the user terminal and the long-distance network, one to the device for detection of data transmission need connected device for change of the characteristics of the data connection based on the detected need of data transmission between the user terminal and the long-distance network, and one to the device for change of the characteristic of the data connection connected connection/disconnection device for connection/disconnection of a data connection between the user terminal and a long-distance network. The connection/disconnection device (9) establishes a data connection between the user terminal and a long-distance network when a need of data transmission is detected, and disconnects the data connection when a lack of need of data transmission is detected during one in advance determined period of time. The device also includes one to the device for change of characteristics of the data connection and to the connection/disconnection device (9) connected device for management of the interface towards the digital, cellular communication network. An advantage of this device

is that it makes that a data connection between the user terminal and the long-distance network is only connected when there is a need of data connection, which results in lower utilisation of resources and consequently also lower cost. One more advantage is that the connection/disconnection of the connection is made without the need of the user entering any commands at the terminal, which simplifies the management for the user. Another advantage with this device is that the device for management of the interface to the digital, cellular network is arranged before the connection/disconnection device (9) and therefore is transparent for the user with regard to said connection/disconnection device. This simplifies the management for the user, for instance if different connection/disconnection devices are used.

One embodiment of the device according to the invention also includes a need detection device for detection of the need of transmission speed between the user terminal and the long-distance network, and a control device for increase, respective reduction, of the transmission speed of the data connection when the need of transmission speed between the user terminal and the long-distance network is greater, respective smaller, than the current transmission speed of the data connection. An advantage is that this embodiment further reduces the consumption of resources, since the transmission speed of the data connection is controlled so that it only covers the need of transmission speed and consequently no unnecessary transmission capacity is established. In that way also the costs for the data connection will be reduced in relation to a data connection with fixed transmission speed.

Another embodiment of the device according to the invention also includes a break detection device for detection of breaks. The connection/disconnection device (9)

establishes, depending on the detected need of data transmission, a data connection between the user terminal and the long-distance network when a break is detected. An advantage of this embodiment is that the user need not 5 initiate a set up of a connection manually if a break occurs. This results in easier management for the user.

One more embodiment of a device according to the invention for use at set up of a data connection in the first 10 digital, cellular communication network between the user and the long-distance network via a second digital, cellular communication network, also includes a device for collection of information about accessible, digital, cellular communication networks, such as accessible 15 digital, cellular communication networks and debiting conditions for resource utilisation in the different communication networks, as resources to an input by a user via a control unit for input by a user. The device also includes a device for selection of a network among the 20 accessible, digital, cellular communication networks based on the information about accessible, digital, cellular communication networks together with in advance determined criteria. For instance can that network be utilised that gives the lowest cost. An advantage of this embodiment is 25 that it gives a possibility to the user to always use that network that gives the lowest cost when the user is outside that area where the first network, in which he/she is subscriber, is accessible and the user consequently must utilise a second network to access the first network, so 30 called roaming.

One more embodiment of a device according to the invention also includes a device for detection of an application that has an intermittent need of transmission of data between 35 the user and the long-distance network, and a device for filtering of the transmissions of these applications

between the user terminal and the long-distance network. An advantage of this embodiment is that applications that are making regular attempts to access a long-distance network and which are not necessary to the user, can be controlled so that unnecessary set ups of connections are avoided. This will reduce the costs for the user.

One more embodiment of a device according to the invention also includes a device for collection of information related to the data connection, such as debiting terms/conditions, error management tables, and accumulated data connection costs since the latest billing, as response to an input by a user via a control unit for input by user. The device also includes a device for measurement of parameters for the data connection, such as the transmission speed of the data connection at each point of time and the time the data connection has the same transmission speed, a device for calculation of characteristic data for the data connection, such as transmission speed, cost so far for the current connection, and cost so far during one in advance determined period of time, based on the connection related information and a device for presentation of these characteristic data to the user for use as basic data for decision for the user. An advantage with this embodiment is that the user will have better basic data to make decisions, such as to decide whether the data connection shall be disconnected when the cost exceeds a certain level.

30 BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in detail in the following, with reference to the enclosed schematic figures, which for the purpose of exemplification show preferred embodiments 35 of the invention.

Figure 1 is a schematic drawing of an environment in which the invention can be used.

5 Figure 2 is a schematic drawing of another environment in which the invention can be used.

Figure 3 shows a block diagram of an embodiment of a device according to the invention.

10 Figure 4 shows a flow chart over a procedure according to the invention.

PREFERRED EMBODIMENTS

15 In Figure 1 is shown an environment in which one embodiment of the invention can be used. A user terminal 1, which includes a computer 2, connected to a mobile terminal 3. The mobile terminal 3 is in its turn connected to a first 20 GSM-network 4. Different types of long-distance networks are connected to the GSM-network. In the figure are shown two examples, Internet 5 and a LAN 6. Connections can be set up via the GSM-network 4 from the user terminal 1 to these long-distance networks.

25 Figure 2 shows another environment in which the invention can be used. In this figure the user terminal 1 is connected to a second GSM-network 7, which in its turn is connected to the first GSM-network 4. This environment can 30 be met with for instance when a user is located outside the area where the first GSM-network 4, in which he/she is subscriber, is accessible and the user consequently must utilise a second GSM-network 7 to access the first network 4, so called roaming.

Figure 3 shows an embodiment of a device 8 according to the invention. The device 8 controls data connections in a GSM-network 4, between a user terminal 1 and a long-distance network, in this case Internet 5 or a LAN 6. The device 5 includes a connection/disconnection device 9 located in the mobile terminal (3 in Figure 1 and 2). The device 8 also includes a need detection device 10, a control device 11, a break detection device 12, and an interface management device 13, which are located in the computer 2 (2 in Figure 10 1 and 2). The computer 2 also includes applications 14, some of which need data connections to any of the long-distance networks.

When the user starts the user terminal, the need detection 15 device 10 starts detecting the need of data transmission speed for the applications 14 in the user terminal. If the need detection device 10 detects that any of the applications 14 in the user terminal 1 has a data transmission need between the user terminal 1 and a long-distance network, it will inform about this to the control 20 device 11, which controls the connection/disconnection device 9 via the interface device 13 to set up a data connection. When a data connection is established, the need detection device 10 detects the need of transmission speed 25 of the application 14 and informs about this to the control device 11, which increases, respective reduces, the transmission speed of the data connection if the need of transmission speed is greater, respective smaller, than the current speed of the data connection. The control device 11 30 utilises hysteresis levels and delay at the increase, respective reduction, of the transmission speed of the data connection, which means that the need of transmission speed of the applications 14 must exceed, respective fall below, the transmission speed of the data connection during one in 35 advance determined period of time, to have the increase respective reduction executed. If the need detection device

10 detects a lack of data transmission need during one in advance determined period of time, it will inform about this to the control device 11, which controls the connection/disconnection device 9 to disconnect the data connection. The break detection device 12 detects whether a break has occurred and, if this is the case, informs about this to the control device 11, which, provided that the need detection device 10 has informed that need of data transmission exists, controls the connection/disconnection 10 device 9 to set up a new data connection from the user terminal 1 to a long-distance network via the GSM-network 3.

In Figure 4 is described a procedure according to invention 15 for control of data connections in a GSM-network 4 between a user terminal 1 and a long-distance network (see Figure 1). When a user switches on the user terminal, the procedure starts and a detection step 15 detects the need 20 of data transmission between the user terminal and a long-distance network and informs about this need to a route selection step 16, which directs the procedure back to the detection step 15 if a lack of need of data transmission is detected, and forwards the procedure to a set up step 17 if a need of data transmission has been detected. The need of 25 data transmission is detected as the need of transmission speed between the user terminal and the long-distance network, for the applications in the user terminal. In the set up step 17, a data connection is set up between the user terminal and the long-distance network via the GSM-network. 30

In a need detection step 18, then the need of transmission speed, between the user terminal and the long-distance network, of the applications in the user terminal is 35 detected and this need is informed about to a route selection step 19.

The route selection step 19 informs about whether the need of transmission speed is higher than the current transmission speed of the data connection to a need increase step 20, which will increase the transmission speed of the data connection. If the need of transmission speed is not higher than the transmission speed of the data connection, the route selection step 19 forwards the procedure to another route selection step 21. The route selection step 21 informs about whether the need of transmission speed is lower than the current transmission speed of the data connection to a need reduction step 22, which reduces the transmission speed of the data connection. If the need of transmission speed is not lower than the transmission speed of the data connection, the route selection steps 21 will forward the procedure to a break step 23. The increase, respective reduction, of the transmission speed of the data connection in the need increase step 20, respective the need reduction step 22, is made by signalling to the GSM-network about allocating more, respective fewer, time slots to the data connection. Hysteresis levels and delay are utilised at the increase, respective reduction, of the transmission speed of the data connection in the need increase step 20, respective the need reduction step 22. This means that the need of transmission speed of the applications must exceed, respective fall below, the transmission speed of the data connection during one in advance determined period of time, to have the increase respective reduction executed.

In the break step 23, breaks in the data connection are detected. If a break is detected, the procedure is forwarded to the detection step 15, where the need of data transmission is detected. If a need of data transmission is detected, a new data connection is established between the user terminal and the long-distance network.

Finally is, in the route selection step 24, detected whether need of data transmission has been lacking during one in advance determined period of time that can be adjusted by the user. In case of such a lack, the data connection is disconnected in a disconnection step 25. If a need is still detected, the connection is held and the procedure is directed to the need detection step 18, at which the procedure continues until a lack of need of data transmission during one in advance determined period of time is detected and the data connection is disconnected.

Even if a number of specific embodiments have been described above, the expert within the field will realise that a lot of modifications of the above described embodiments of the invention are possible within the frame of the invention, as defined by the subsequent patent claims. For instance has a device been described where the different devices have been implemented in a computer and a mobile terminal. These devices can of course be implemented in a computer only, in a mobile terminal only, or in a combination of these.

The embodiments are also described for GSM-technology. The invention can of course also be implemented for any other time multiplexed, cellular technology, such as the American technologies D-AMPS (Digital-Advanced Mobile Phone System) and PCS (Personal Communication Services), or the Japanese PDC (Personal Digital Cellular).

Finally the embodiments also have been described with Internet and a LAN as long-distance networks. These shall only be regarded as examples and not as a limitation of the invention.

PATENT CLAIMS

1. Procedure for control of data connections in a first digital, cellular communication network (4) between a user terminal (1) and a long-distance network (5, 6), which includes the steps:

to detect (15) need of data transmission between the user terminal (1) and a long-distance network (5, 6),

10 to set up (17) a data connection between the user terminal (1) and the long-distance network (5, 6) depending on the detected need of data transmission between the user terminal (1) and the long-distance network (5, 6) and

15 to change (20, 22) the characteristics of the data connection depending on the detected need of data transmission between the user terminal (1) and the long-distance network (5, 6)

20 2. Procedure as claimed in patent claim 1, at which the step to detect the need of transmission includes the step:

25 to detect the need of transmission speed between the user terminal (1) and the long-distance network (5, 6),

at which the step to change the characteristics of the data connection includes the steps:

30 to increase (20) the transmission speed of the data connection when the need of transmission speed between the user terminal (1) and the long-distance network (5, 6) is greater than the current transmission speed of the data connection; and

to reduce (22) the transmission speed of the data connection when the need of transmission speed between the user terminal (1) and the long-distance network (5,6) is smaller than the current transmission speed of the data connection.

3. Procedure as claimed in ~~patent~~ claim 2, at which the steps (20,22) to increase, respective reduce, the transmission speed of the data connection are made by means of hysteresis levels and by a delay for limitation of the number of changes in transmission speed.

4. Procedure as claimed in patent claim 1, at which the step to change the characteristics of the data connection includes the step:

to disconnect the data connection when a lack of need of data transmission between the user terminal (1) and the long-distance network (5,6) is detected during one in advance determined period of time.

5. Procedure as claimed in patent claim 1, which also include the steps:

25 to detect a break in the data connection,

to, when a break has been detected, set up a data connection between the user terminal (1) and the long-distance network (5,6), depending on the detected need of data transmission between the user terminal (1) and the long-distance network (5,6).

35 6. Procedure as claimed in patent claim 1, at which the need of data transmission between the user terminal (1) and the long-distance network (5,6) is detected as in the user terminal (1) located need of data transmission of at least

one application (14) between the user terminal (1) and the long-distance network (5, 6).

7. Procedure as claimed in patent claim 2, at which the need of transmission speed between the user terminal (1) and the long-distance network (5, 6) is detected as in the user terminal (1) located need of transmission speed of at least one application (14) between the user terminal (1) and the long-distance network (5, 6).

10 8. Procedure as claimed in patent claim 1, at which the data connection in the first digital, cellular communication network between the user terminal (1) and the long-distance network (5, 6) is set up via a second, 15 digital, cellular communication network (7), which procedure also includes the steps:

20 to, depending on an input by a user, collect information about accessible, digital, cellular communication networks,

25 to, depending on the information about accessible, digital, cellular communication networks, together with in advance determined criteria, utilise a network among the accessible digital, cellular communication networks.

30 9. Procedure as claimed in patent claim 8, at which the information about accessible, digital, cellular communication networks include accessible, digital, cellular communication networks and debiting terms/conditions for utilisation of resources in the different communication networks.

35 10. Procedure as claimed in any of the patent claims 8 or 9, at which the network that gives the lowest cost is utilised.

11. Procedure as claimed in patent claim 1, which also includes the steps:

to detect an application that has an intermittent need of
5 data transmission between the user terminal (1) and the long-distance network (5, 6),

to filter the transmissions of this application between the user terminal (1) and the long-distance network (5, 6).

10 12. Procedure as claimed in patent claim 1, which also includes the steps:

15 to, depending on an input by a user, collect data connection related information,

to measure parameters for the data connection,

20 to, depending on the data connection related information, calculate characteristic data for the data connection, and

to show this characteristic data to the user on a status screen for use as basic data for decision for the user.

25 13. Procedure as claimed in patent claim 12, at which the measured parameters of the data connection include the transmission speed of the data connection at each point of time and the time that the data connection has the same data transmission speed.

30 14. Procedure as claimed in patent claim 12, at which the data connection related information includes at least any of debiting conditions and error management tables.

35 15. Procedure as claimed in patent claim 12, at which the characteristic data of the data connection include at least

any of transmission speed, cost so far for the current data connection, and cost so far during one in advance determined period of time.

5 16. Procedure as claimed in patent claim 12, which also includes the steps

to collect current debiting data from the first communication network (4) and

10 to show this debiting data for the user for use as basic data for decision by the user.

15 17. Procedure as claimed in patent claim 16, at which current debiting data include accumulated data connection costs since the latest billing.

20 18. Procedure as claimed in patent claim 1, at which the data connection is set up in a digital, cellular communication network with time division multiplex access.

25 19. Procedure as claimed in patent claim 2, at which the data connection is set up in a digital, cellular communication network with time division multiplex access, and at which the steps (20,22) to increase, respective reduce, the transmission speed of the data connection, is made by increasing, respective reducing, the number of time slots that are allocated to the data connection.

30 20. Procedure as claimed in the patent claims 18 or 19, at which the digital, cellular, communication network is any of a GSM-network, a D-AMPS-network, a PCS-network, or a PDC-network.

21. Procedure as claimed in patent claim 1, at which the data connection is set up via a separate terminal for digital, cellular communication.

5 22. Procedure as claimed in patent claim 21, where the separate terminal is any of a GSM-terminal, a D-AMPS-terminal, a PCS-terminal, or a PDC-terminal.

10 23. Procedure as claimed in patent claim 1, at which the data connection is set up over a HSCSD-service.

24. Procedure as claimed in patent claim 1, at which use without need of any manual changes of adjustments in the user terminal (1) exists.

15 25. Device for control of data connections in a first digital, cellular communication network (4), which includes:

20 a device (10) for detection of data transmission need between a user terminal (1) and the long-distance network (5, 6),

25 one to the device (10) for detection of data transmission need connected device (11) for change of the characteristics of the data connection, depending on the detected need of data transmission between the user terminal (1) and the long-distance network (5, 6),

30 one to the device (11) for change of the characteristics of the data connection connected connection/disconnection device (9) for connection/disconnection of a data connection between the user terminal (1) and a long-distance network (5, 6), at which the

35 connection/disconnection device (9) sets up a data connection between the user terminal (1) and a long-

distance network (5, 6), when a need of data transmission is detected, and disconnects the data connection when a lack of need of data transmission is detected during one in advance determined period of time, and

5

one to the device (11) for change of the characteristics of the data connection and to the connection/disconnection device (9) connected interface management device (13) for management of the interface towards the digital, cellular 10 communication network (4).

26. Device as claimed in the patent claim 25, in which the device (10) for detection of need of transmission is a need detection device for detection of the need of transmission 15 speed between the user terminal (1) and the long-distance network (5, 6),

and in which the device (11) for change of the characteristics of the data connection is a control device 20 for increase, respective reduction, of the transmission speed of the data connections when the need of transmission speed between the user terminal (1) and the long-distance network (5, 6) is greater respective smaller than the current transmission speed of the data connection.

25

27. Device as claimed in the patent claim 26, in which the control device (11) utilises hysteresis levels and a delay to limit the number of changes in transmission speed.

30 28. Device as claimed in the patent claim 25, which also includes:

a break detection device (12) for detection of break in the data connection, at which the connection/disconnection 35 device (9), depending on the detected need of data transmission, sets up a data connection between the user

terminal (1) and the long-distance network (5, 6) when a break is detected.

29. Device as claimed in the patent claim 25, at which the device (10) for detection of the need of data transmission between the user terminal (1) and the long-distance network (5, 6) detects the need of transmission speed, of in the user terminal (1) located applications (14), between the user terminal (1) and the long-distance network (5, 6).

10 30. Device as claimed in the patent claim 26, at which the need detection device (10) detects the need of transmission speed, of in the user terminal (1) located applications (14), between the user terminal (1) and the long-distance network (5, 6).

20 31. Device as claimed in the patent claim 25, for use at set up of a data connection in the first digital, cellular communication network (4) between the user terminal (1) and the long-distance network (5, 6) via a second digital, cellular communication network, which device also includes:

25 a device for collection of information about accessible digital, cellular communication networks as response to an input by the user via a control unit for input by user,

30 a device for selection of a network among the accessible digital, cellular communication networks on basis of the information about accessible, digital, cellular communication networks together with in advance determined criteria.

35 32. Device as claimed in the patent claim 31, at which the information about accessible digital, cellular communication networks includes accessible digital, cellular communication networks and debiting conditions for

utilisation of resources in the different communication networks.

33. Device as claimed in the patent claim 31, in which the device for selection of a network and that selects the network that gives the lowest cost, is utilised.

34. Device as claimed in the patent claim 25, which also includes:

10 a device for detection of an application that has an intermittent need of data transmission between the user terminal (1) and the long-distance network (5, 6),

15 a device for filtering of the transmissions of this application between the user terminal (1) and the long-distance network (5, 6).

35. Device as claimed in the patent claim 25, which also 20 includes:

25 a device for collection of data connection related information as response to an input by a user via a control unit for input by user,

a device for measuring of parameters for the data connection,

30 a device for calculation of characteristic data for the data connection on basis of the connection related information, and

a device for presentation of these characteristic data to the user for use as basic data for decision by the user.

36. Device as claimed in the patent claim 35, at which the measured parameters of the data connection include the transmission speed of the data connection at each point of time, and the time the data connection has the same 5 transmission speed.

37. Device as claimed in the patent claim 35, at which the data connection related information includes at least any of debiting conditions and error management tables.

10 38. Device as claimed in the patent claim 35, at which the characteristic data of the data connection include at least any of transmission speed, cost so far for the current connection, and cost so far during one in advance 15 determined period of time.

39. Device as claimed in the patent claim 35, at which the data connection related information also includes current debiting data from the first communication network.

20 40. Device as claimed in the patent claim 39, at which current debiting data include accumulated data connection costs since the latest billing.

25 41. Device as claimed in the patent claim 25, at which the digital, cellular communication network (4) has time division multiplex access.

30 42. Device as claimed in the patent claim 25, at which the digital, cellular communication network has time division multiplex access, and where the control device for increase 35 respective reduction of the transmission speed of the data connection utilises increase, respective reduction, of the number of time slots that are allocated to the data connection.

43. Device as claimed in the patent claims 25 or 26, at which the digital, cellular communication network is any of a GSM-network, a D-AMPS-network, a PCS-network, or a PDC-network.

5 44. Device as claimed in the patent claim 25, in which the user terminal (1) includes a separate terminal (3) for digital, cellular communication.

10 45. Device as claimed in the patent claim 44, in which the separate terminal (3) is any of a GSM-terminal, a D-AMPS-terminal, a PCS-terminal, or a PDC-terminal.

15 46. Device as claimed in the patent claim 25, at which the user terminal (1) is a computer.

47. Device as claimed in the patent claim 25, at which the user terminal (1) is a mobile terminal.

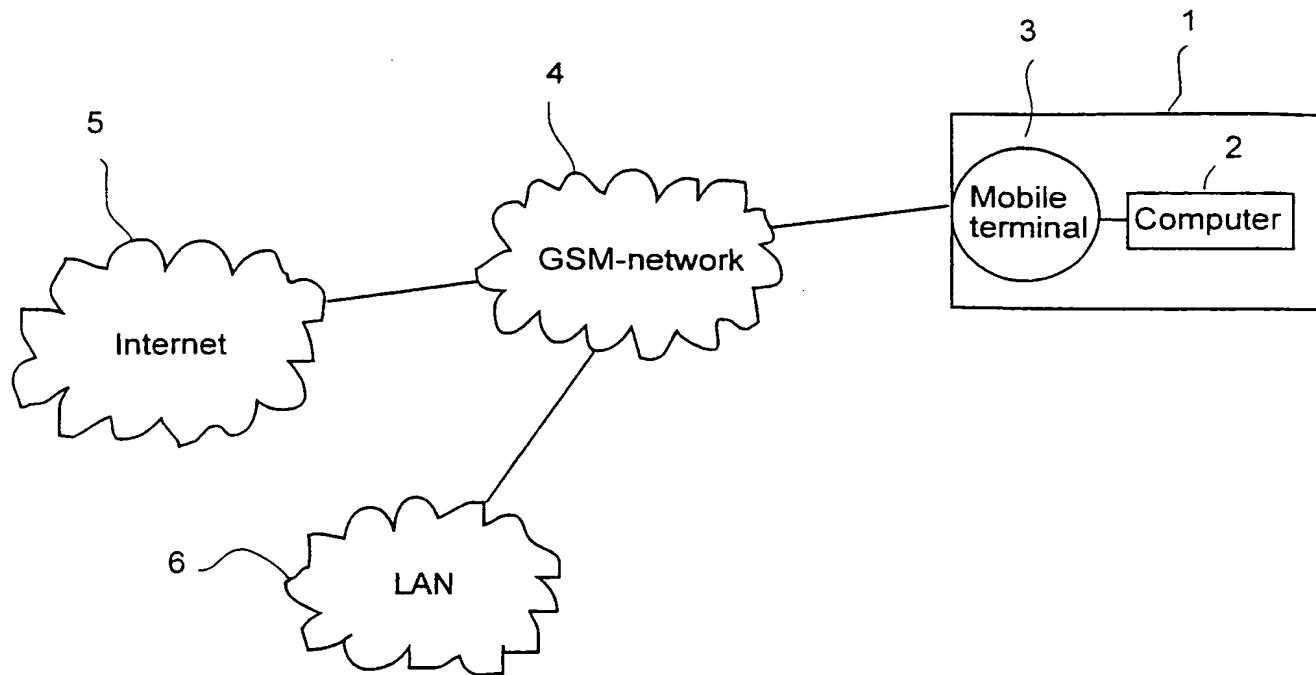
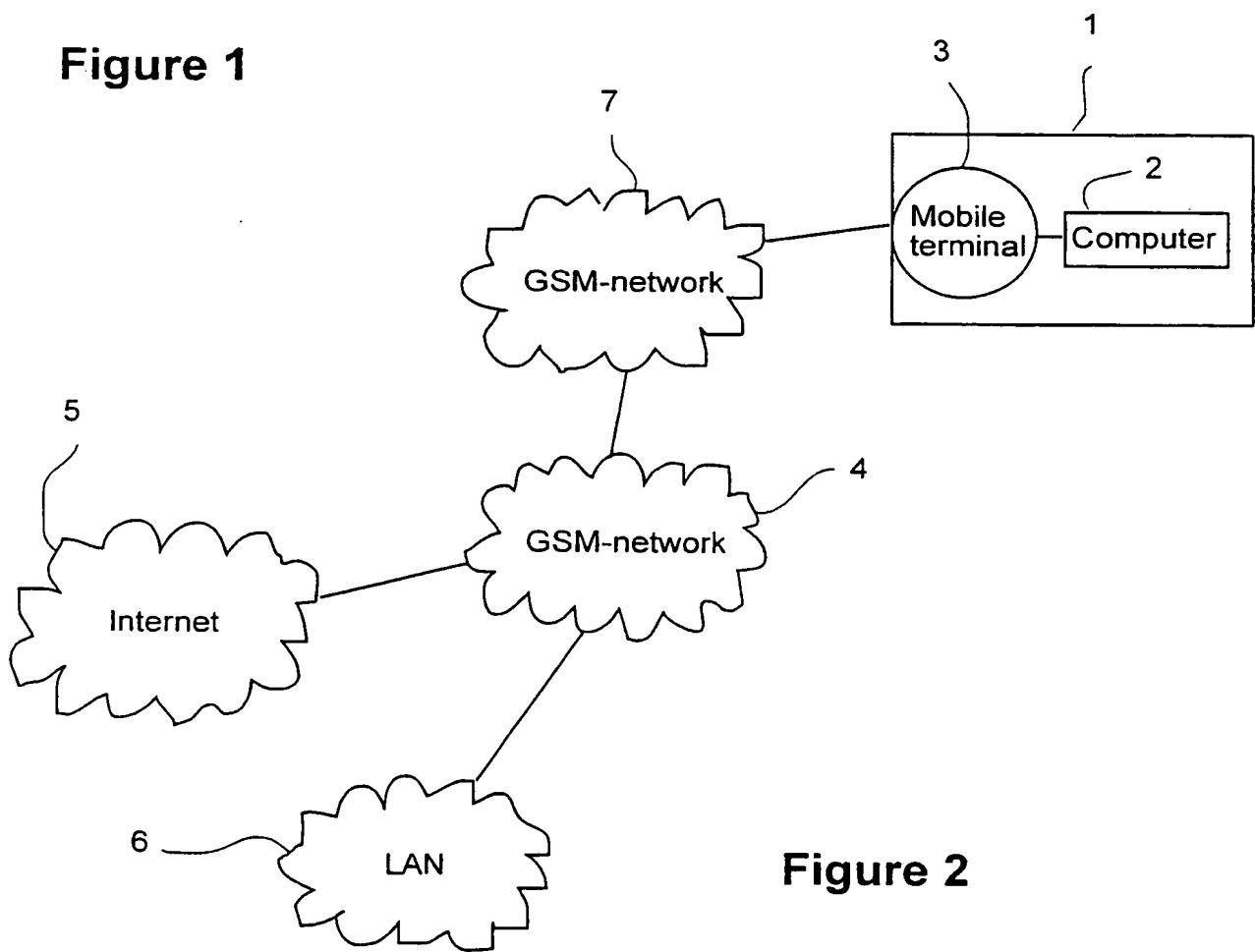
20 48. Device as claimed in any of the patent claims 25-47, at which at least one of the devices is arranged in a computer, and at least one of the devices is arranged in a mobile terminal.

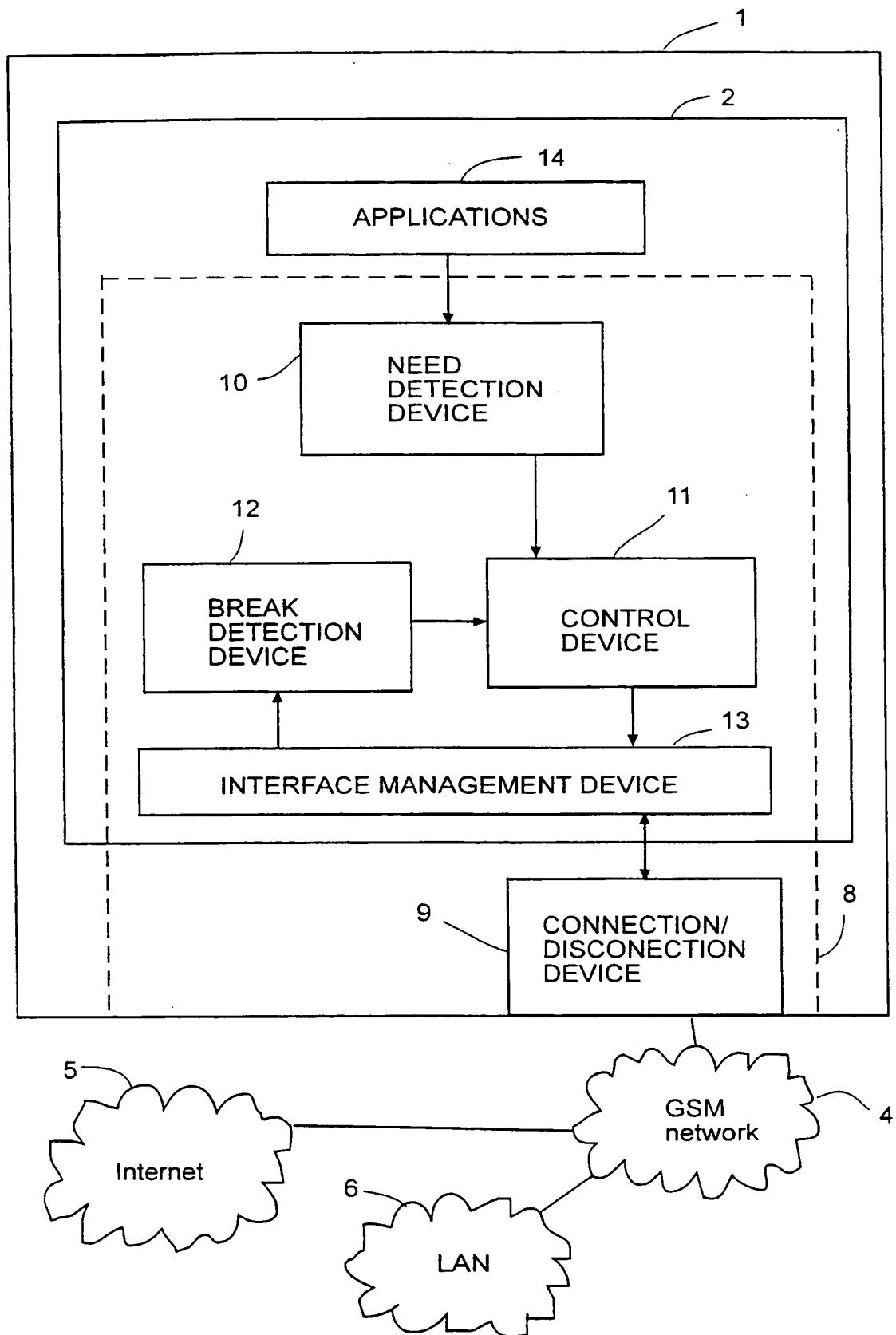
25 49. Use of a device as claimed in any of the patent claims 25-48 for data connections over a HSCSD-service.

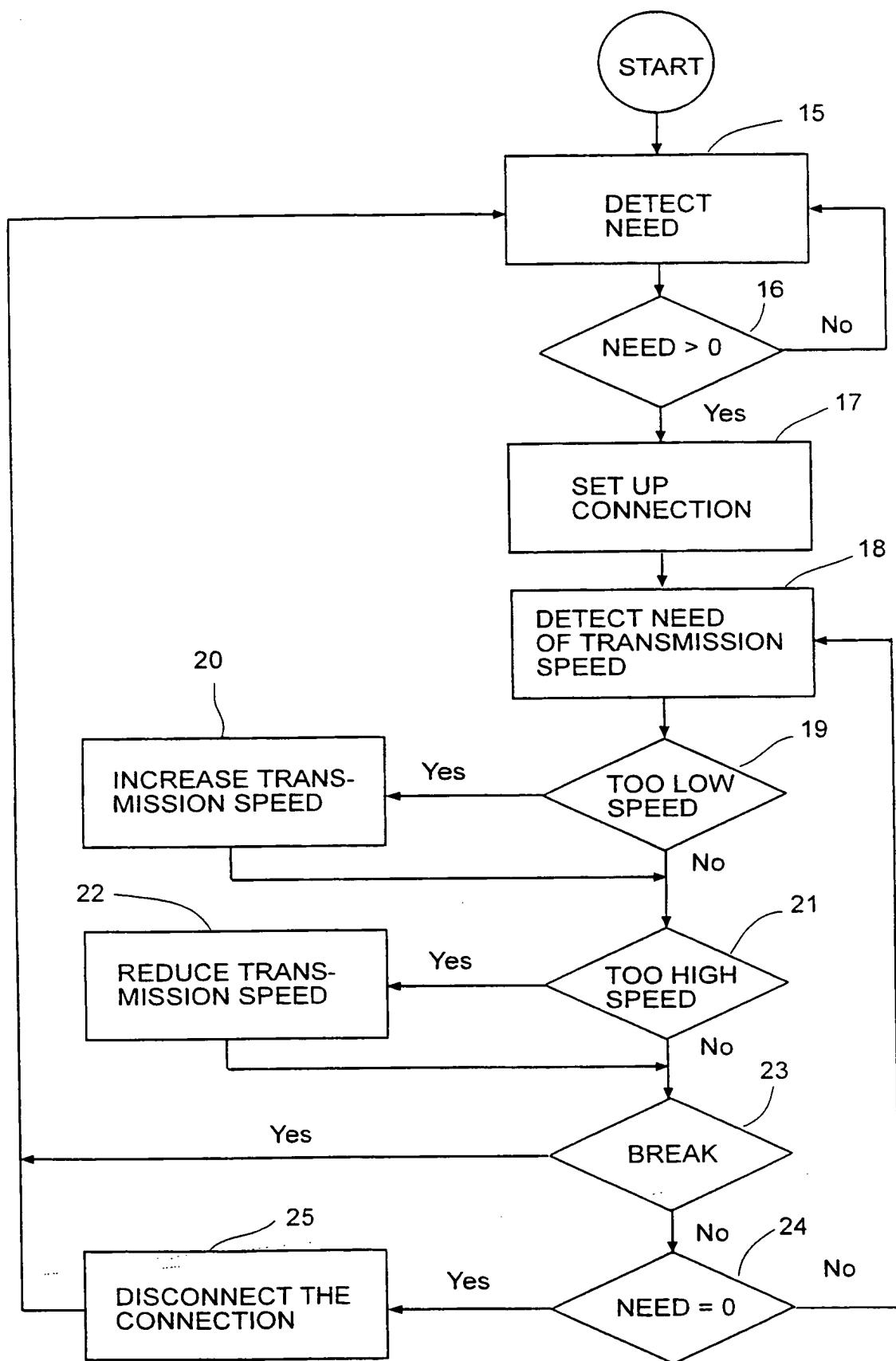
50. Procedure for upgrading of a device for control of data connections in a first digital, cellular communication network (4) between a user terminal (1) and a long-distance network (5, 6), which includes the steps:

30 to store modules for the device centrally,

- to, after a request controlled by the user, set up a connection from a user terminal (1) to the place where the modules are stored centrally,
- 5 to collect one or more modules in the device, and to replace in the user terminal (1) existing modules with respective collected module.

**Figure 1****Figure 2**

**Figure 3**

**Figure 4**

1
INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/00746

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9610305 A2 (NOKIA TELECOMMUNICATIONS OY), 4 April 1996 (04.04.96), page 3, line 17 - page 5, line 10; page 8, line 7 - page 9, line 11	1-2,6-7, 18-26,29-30, 41-49
Y	--	4-5,28
Y	US 5708656 A (J. NONEMAN ET AL), 13 January 1998 (13.01.98), column 2, line 14 - line 54; column 4, line 33 - column 5, line 67, abstract	4-5,28
A	WO 9836589 A1 (NOKIA MOBILE PHONES LTD.), 20 August 1998 (20.08.98), abstract	1,25
	--	

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier document but published on or after the international filing date	"P" document of particular relevance; the claimed invention can not be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"I" document which may throw doubt on priority claimed or which is cited to establish the publication date of another citation or other special reasons as specified	"Y" document of particular relevance; the claimed invention can not be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	& document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

Date of mailing of the international search report

22-09-2000

15 Sept 2000

Name and mailing address of the ISA
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86Authorized officer
Jaana Raivio / js
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00746

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9737504 A1 (NOKIA TELECOMMUNICATIONS OY), 9 October 1997 (09.10.97), abstract --	1,25
A	US 5208831 A (M. UENO ET AL), 4 May 1993 (04.05.93), column 2, line 3 - line 36 -- -----	1,25

INTERNATIONAL SEARCH REPORT
Information on patent family members

28/06/00

International application No.

PCT/SE 00/00746

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
WO 9610305 A2	04/04/96		AU 696802 B AU 3524095 A CA 2200307 A EP 0783811 A FI 96558 B,C FI 944488 D FI 971270 A JP 10509566 T US 6072787 A	17/09/98 19/04/96 04/04/96 16/07/97 29/03/96 00/00/00 26/03/97 14/09/98 06/06/00
US 5708656 A	13/01/98		EP 0830040 A	18/03/98
WO 9836589 A1	20/08/98		AU 5990098 A CN 1247006 T DE 19882087 T EP 0963664 A FI 103165 B FI 970596 A	08/09/98 08/03/00 16/12/99 15/12/99 00/00/00 13/08/98
WO 9737504 A1	09/10/97		AU 2029897 A CA 2250064 A CN 1215534 A EP 0891677 A FI 103454 B FI 961472 A	22/10/97 09/10/97 28/04/99 20/01/99 00/00/00 02/10/97
US 5208831 A	04/05/93		DE 69026572 D,T EP 0425317 A,B JP 2045156 C JP 3205942 A JP 7079366 B KR 9401757 B	02/10/96 02/05/91 09/04/96 09/09/91 23/08/95 05/03/94

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/SE00/00746**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

... / ...

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.